Meat Hygiene

Poultry Meat Hygiene

I ❤ Chickens

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poultry Meat Hygiene

poultry:

any type of domesticated fowl (Live or dressed) primarily raised for meat.

Techanical terms for poultry:

- **Broilers:**

young ♂ or ♀ soft-boned chickens (9 wks old) with Live weight of ~ 1.8 Kg

- **Roaster:**

♂ or ♀ chickens (3-6 months old) with Live weight of > 2 Kg.

- **Cockerels:**

♂ soft-boned chickens mature to be classed as broiler, but not old enough to be classed as roasters.

- **Capons:**

Castrated ♂ chickens (7-10 months old) > 3 Kg

- **poussins (MiLK chickens):**

- young ♂ or ♀ chickens (4-5 wks old), 1/4 - 1/2 Kg
- Fed on ground foodstuffs mixed with fat and miLK.

- **Hens:**

- young hens have fLexible breastbone and beak
- old hens → ♀ at end of Laying Life > 3 Kg

poultry meat:

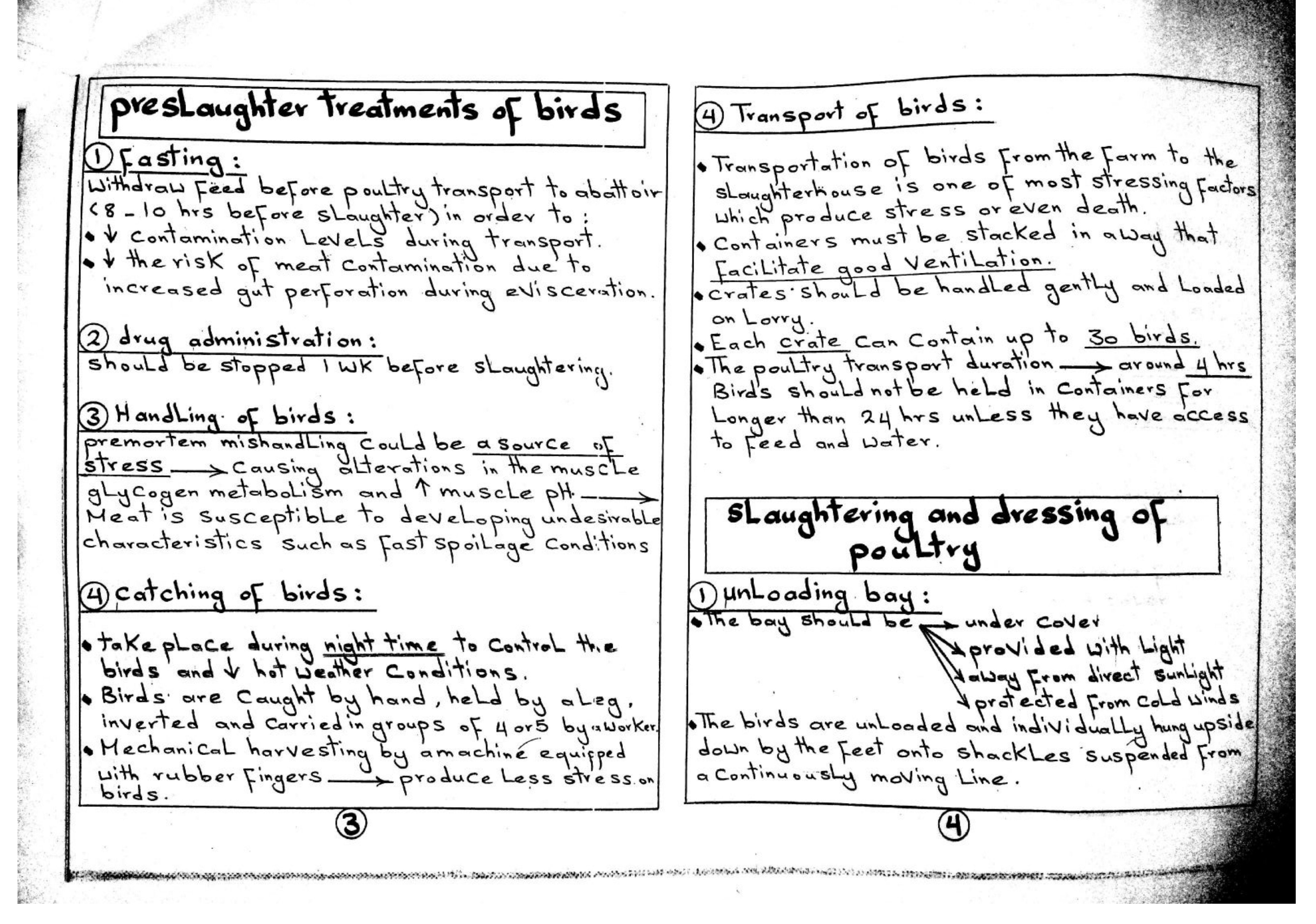
→ white meat (breast)
→ dark meat (wings and drumsticks)

Chemical composition of poultry meat:

- Chemical composition of chicken meat among other meat types:

chemical Composition%	whole chicken	Beef	Lamb	salmon
Moisture	73.6	70-73	73	.64
protein	20-23	20-22	20	20-22
Fat	4.7	4-8	5-6	13-15
ash	1	1	1.6	1.3

- poultry is a good source of high quality protein and contain all essential A.A → It contains more protein than red meats.
- poultry meat is Low in fat
- chicken is a good source of niacin, riboflavin, thiamine and ascorbic acid.
- chicken is a good source of phosphorus, potassium and selenium.



preSlaughter treatments of birds

① Fasting:

Withdraw Feed before poultry transport to abattoir (8 - 10 hrs before slaughter) in order to:

- ↓ Contamination Levels during transport.
- ↓ the risk of meat contamination due to increased gut perforation during evisceration.

② drug administration:

should be stopped 1 WK before slaughtering.

③ Handling of birds:

premortem mishandling could be a source of stress ⟶ causing alterations in the muscle glycogen metabolism and ↑ muscle pH ⟶ Meat is susceptible to developing undesirable characteristics such as fast spoilage conditions

④ catching of birds:

- take place during night time to control the birds and ↓ hot weather conditions.
- Birds are caught by hand, held by a leg, inverted and carried in groups of 4 or 5 by a worker.
- Mechanical harvesting by a machine equipped with rubber fingers ⟶ produce less stress on birds.

③

④ Transport of birds:

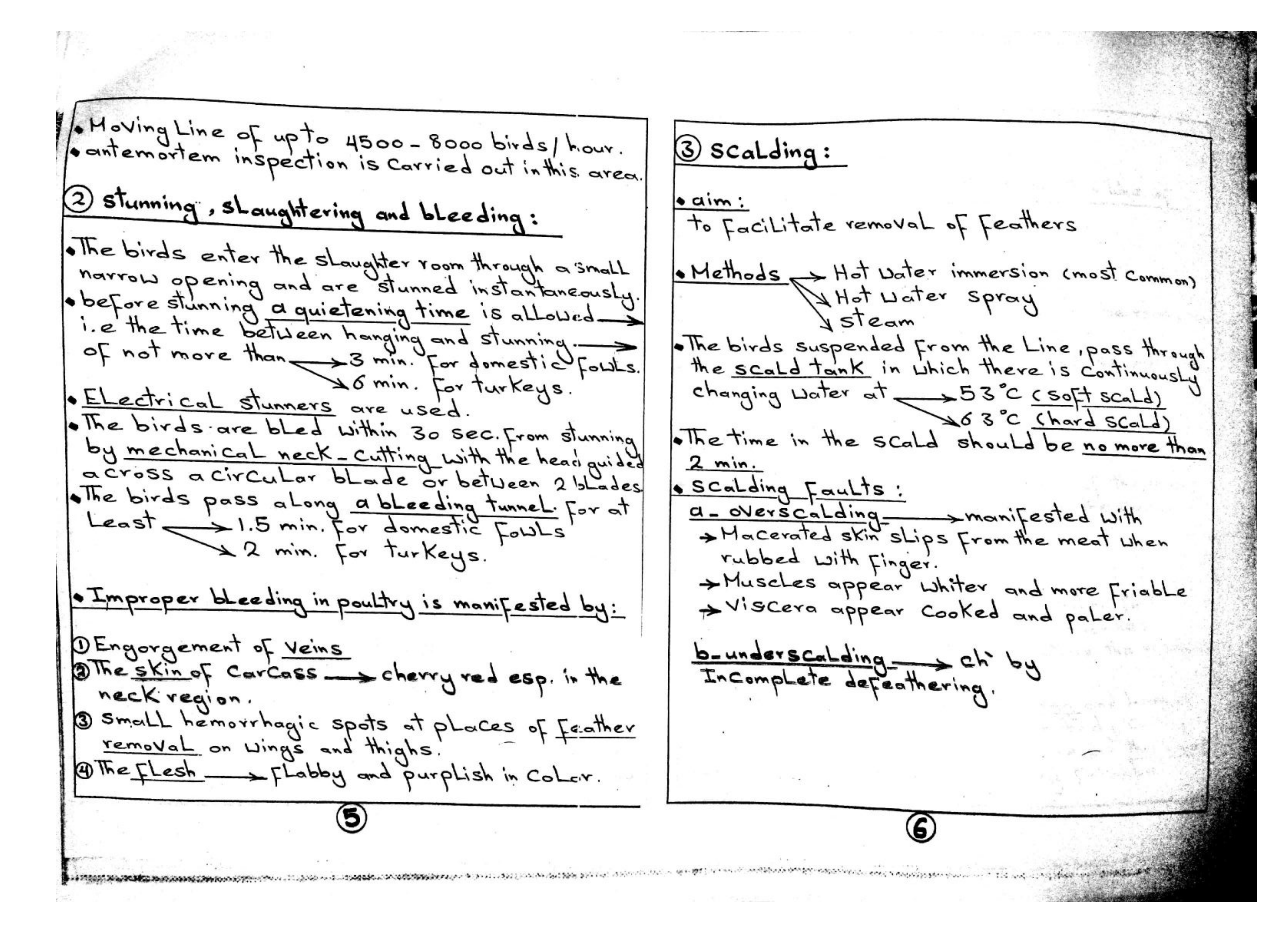
- Transportation of birds from the farm to the slaughterhouse is one of most stressing factors which produce stress or even death.
- Containers must be stacked in a way that facilitate good ventilation.
- crates should be handled gently and loaded on lorry.
- Each crate can contain up to 30 birds.
- The poultry transport duration ⟶ around 4 hrs. Birds should not be held in containers for longer than 24 hrs unless they have access to feed and water.

sLaughtering and dressing of poultry

① unLoading bay:

- The bay should be ⟶ under cover
  - ⟶ provided with light
  - ⟶ away from direct sunlight
  - ⟶ protected from cold winds
- The birds are unloaded and individually hung upside down by the feet onto shackles suspended from a continuously moving line.

④



- Moving Line of up to 4500 - 8000 birds / hour.
- antemortem inspection is carried out in this area.

② stunning, slaughtering and bleeding:

- The birds enter the slaughter room through a small narrow opening and are stunned instantaneously.
- before stunning a quietening time is allowed → i.e the time between hanging and stunning → of not more than → 3 min. for domestic fowls. → 6 min. for turkeys.
- Electrical stunners are used.
- The birds are bled within 30 sec. from stunning by mechanical neck-cutting with the head guided across a circular blade or between 2 blades.
- The birds pass along a bleeding tunnel. for at Least → 1.5 min. for domestic fowls → 2 min. for turkeys.

- **Improper bleeding in poultry is manifested by:**

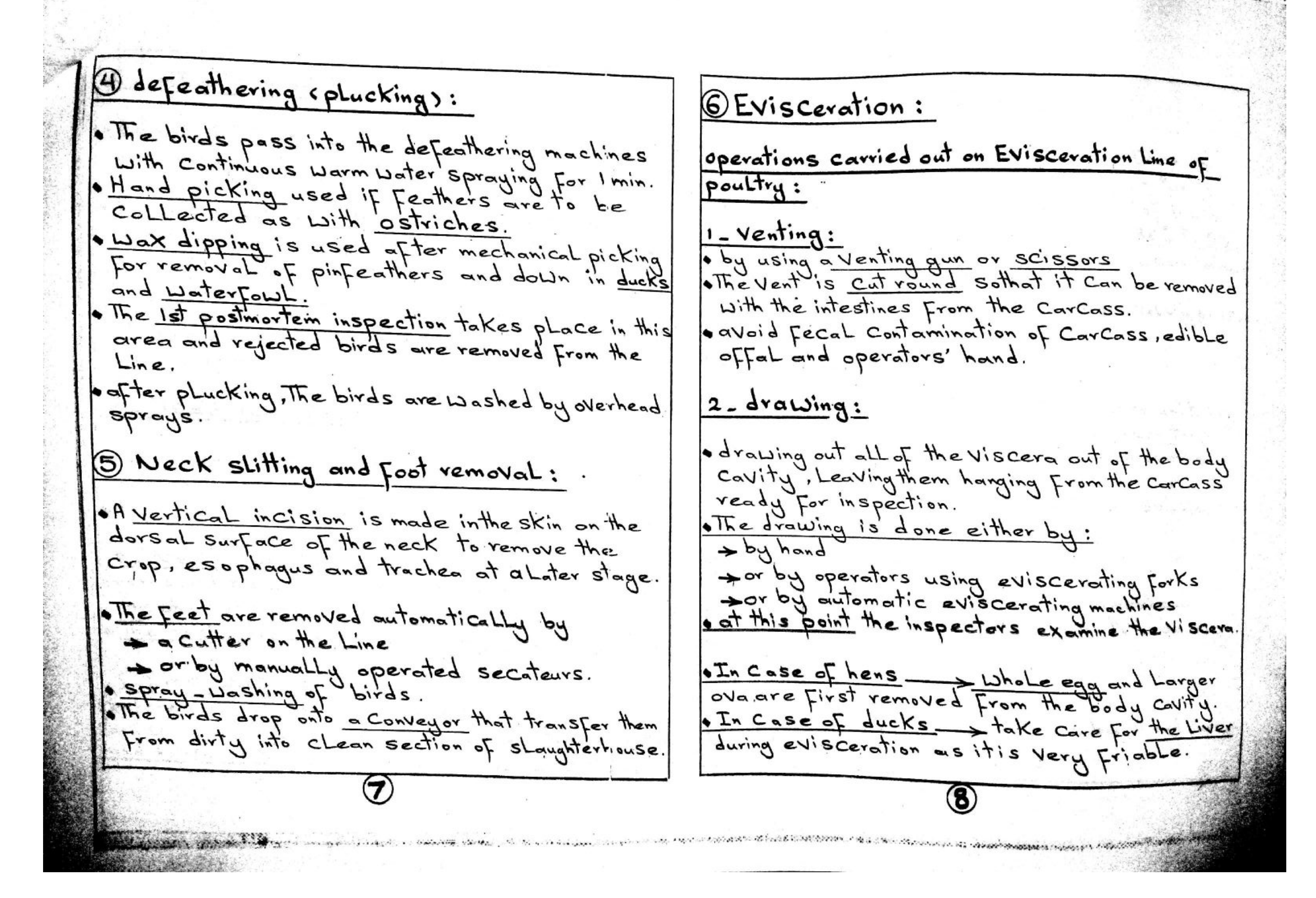
1. Engorgement of veins
2. The skin of carcass → cherry red esp. in the neck region.
3. Small hemorrhagic spots at places of feather removal on wings and thighs.
4. The flesh → flabby and purplish in color.

③ scalding:

- aim:
  to facilitate removal of feathers
- Methods → Hot water immersion (most common) → Hot water spray → steam
- The birds suspended from the Line, pass through the scald tank in which there is continuously changing water at → 53 °C (soft scald) → 63 °C (hard scald)
- The time in the scald should be **no more than** 2 min.
- scalding faults:

a- overscalding → manifested with
→ Macerated skin slips from the meat when rubbed with finger.
→ Muscles appear whiter and more friable
→ Viscera appear cooked and paler.

b- underscalding → ch' by Incomplete defeathering.



④ defeathering (plucking):

- The birds pass into the defeathering machines with continuous warm water spraying for 1 min.
- Hand picking used if feathers are to be collected as with ostriches.
- Wax dipping is used after mechanical picking for removal of pinfeathers and down in ducks and waterfowl.
- The 1st postmortem inspection takes place in this area and rejected birds are removed from the line.
- after plucking, The birds are washed by overhead sprays.

⑤ Neck slitting and foot removal:

- A vertical incision is made in the skin on the dorsal surface of the neck to remove the crop, esophagus and trachea at a later stage.
- The feet are removed automatically by
  - → a cutter on the line
  - → or by manually operated secateurs.
- Spray-washing of birds.
- The birds drop onto a conveyor that transfer them from dirty into clean section of slaughterhouse.

⑥ Evisceration:

operations carried out on Evisceration line of poultry:

1- Venting:

- by using a venting gun or scissors
- The vent is cut round so that it can be removed with the intestines from the carcass.
- avoid fecal contamination of carcass, edible offal and operators' hand.

2- drawing:

- drawing out all of the viscera out of the body cavity, leaving them hanging from the carcass ready for inspection.
- The drawing is done either by:
  - → by hand
  - → or by operators using eviscerating forks
  - → or by automatic eviscerating machines
- at this point the inspectors examine the viscera.
- In case of hens → whole egg and larger ova are first removed from the body cavity.
- In case of ducks → take care for the liver during evisceration as it is very friable.

c- offal removal :

- **Edible offal or giblets** (heart, Liver and gizzard) are removed for further cleaning and washing.
- **Inedible offal** (intestines, proventriculus and Lungs) → are discarded into the water trough or mechanical conveyor.
- Introduce a suction tube into the body cavity to remove any contamination or portions of Lungs remaining.

d- Head removal :

- removed mechanically by traction of a head puller on the Line.
- This also removes the crop, esophagus and trachea.

e- Neck removal :

- removed by cutting through the vertebrae between the shoulder using automatic or manual secateurs.
- The necks are classified as edible offal (giblets).

f- Line washing :

before going into the washing and cooling tanks, birds are spray washed to remove blood and extraneous matter and ↓ total microbial Load on poultry carcasses.

(7) Washing and cooling :

- The birds are dropped automatically from the evisceration Line into **Long spin washer tanks** which contain mains water at a temp. of 10-16°C for 10 min. → ↓ body temp. from **36°C to 25°C**
- Chlorination (50 ppm free chlorine) → completely kills bacteria in the tanks.
- birds are pushed along the tanks by revolving paddles

(8) Chilling :

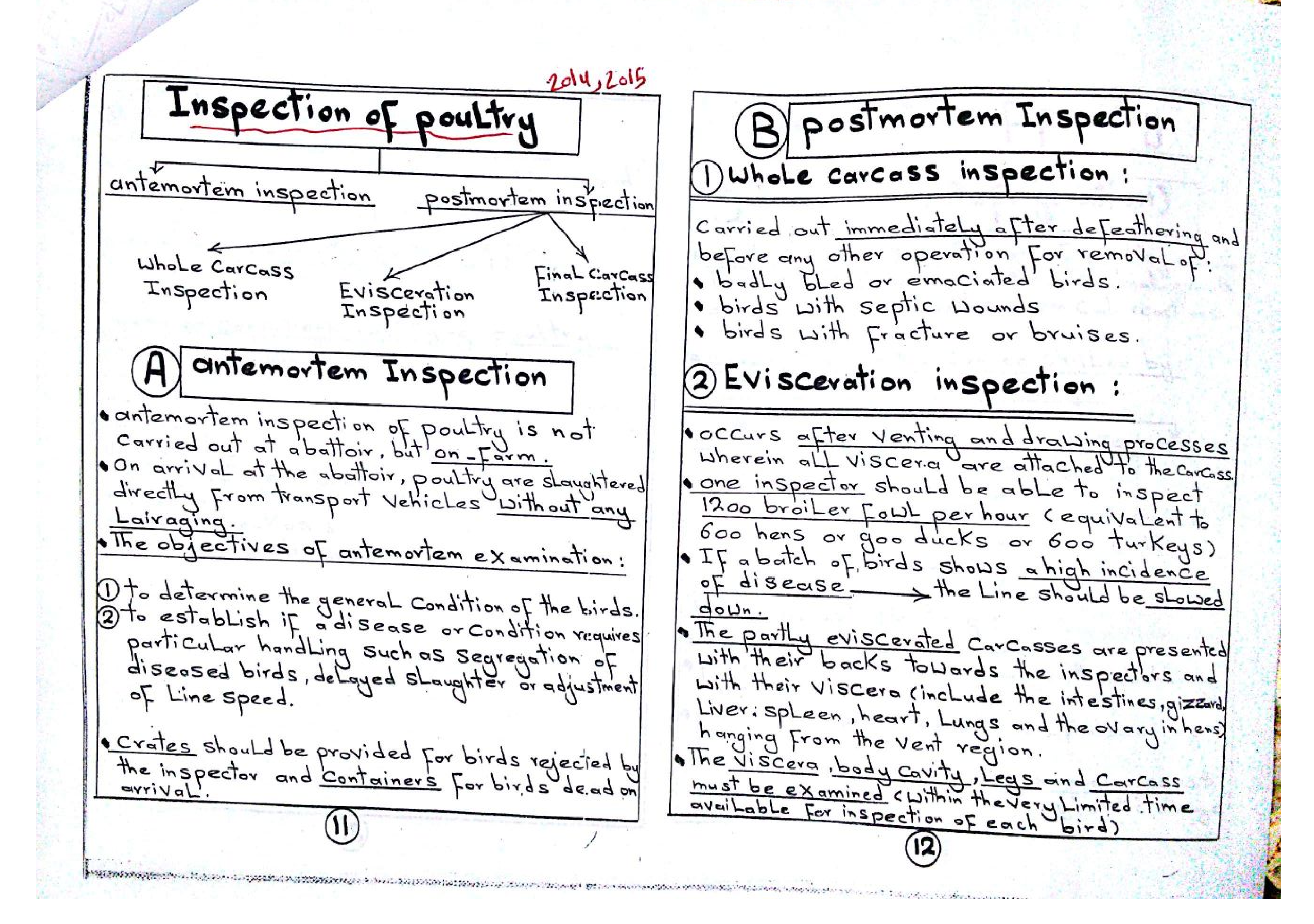
- birds are transferred from the washer unit by an elevator into **Long immersion chiller tank** into which flake ice is dropped from overhead flake-ice machine.
- birds remain in the chiller tank for 30-40 min. and Leave at a temp. of **2-4°C**.

(9) Draining :

birds are hung by the hocks on an overhead conveyor or draining Line for 10 min. to Lose any excess water.

(10) Freezing :

birds are packed into polythene bags and frozen to a temp. of -18°C.



2014, 2015

Inspection of poultry

- antemortem inspection
- postmortem inspection
  - Whole Carcass Inspection
  - Evisceration Inspection
  - Final Carcass Inspection

(A) antemortem Inspection

- antemortem inspection of poultry is not carried out at abattoir, but on-farm.
- On arrival at the abattoir, poultry are slaughtered directly from transport vehicles without any Lairaging.
- The objectives of antemortem examination:

(1) to determine the general condition of the birds.
(2) to establish if a disease or condition requires particular handling such as segregation of diseased birds, delayed slaughter or adjustment of Line speed.

- Crates should be provided for birds rejected by the inspector and Containers for birds dead on arrival.

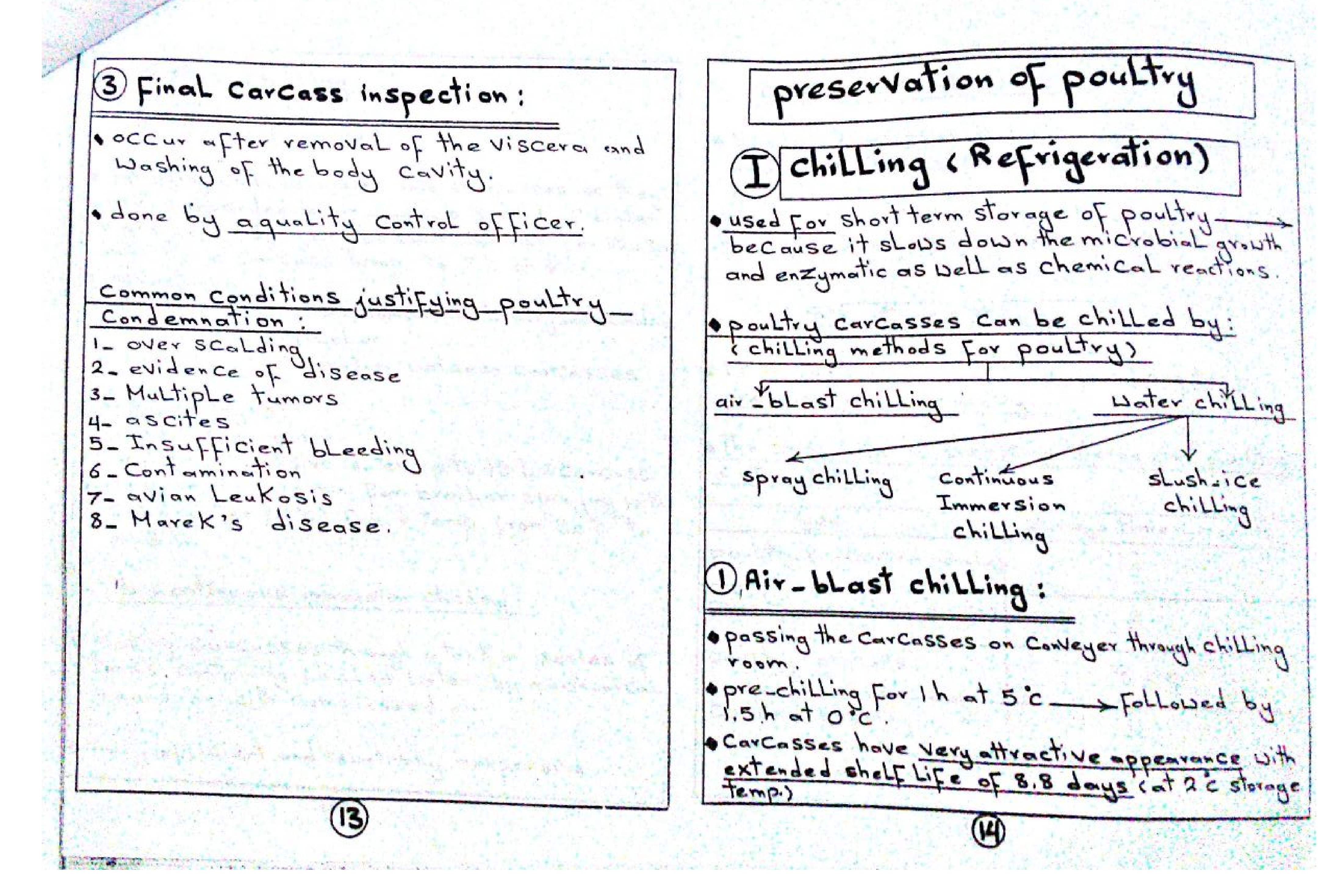
(B) postmortem Inspection

(1) Whole carcass inspection:

Carried out immediately after defeathering and before any other operation for removal of:
- badly bled or emaciated birds.
- birds with septic wounds
- birds with fracture or bruises.

(2) Evisceration inspection:

- occurs after venting and drawing processes wherein all viscera are attached to the carcass.
- one inspector should be able to inspect 1200 broiler fowl per hour (equivalent to 600 hens or 900 ducks or 600 turkeys)
- If a batch of birds shows a high incidence of disease → the Line should be slowed down.
- The partly eviscerated carcasses are presented with their backs towards the inspectors and with their viscera (include the intestines, gizzard, Liver, spleen, heart, Lungs and the ovary in hens) hanging from the vent region.
- The viscera, body cavity, Legs and carcass must be examined (within the very Limited time available for inspection of each bird)



③ Final carcass inspection :

- occur after removal of the viscera and washing of the body cavity.
- done by a quality control officer.

Common conditions justifying poultry condemnation :

1- over scalding
2- evidence of disease
3- Multiple tumors
4- ascites
5- Insufficient bleeding
6- Contamination
7- avian Leukosis
8- Marek's disease.

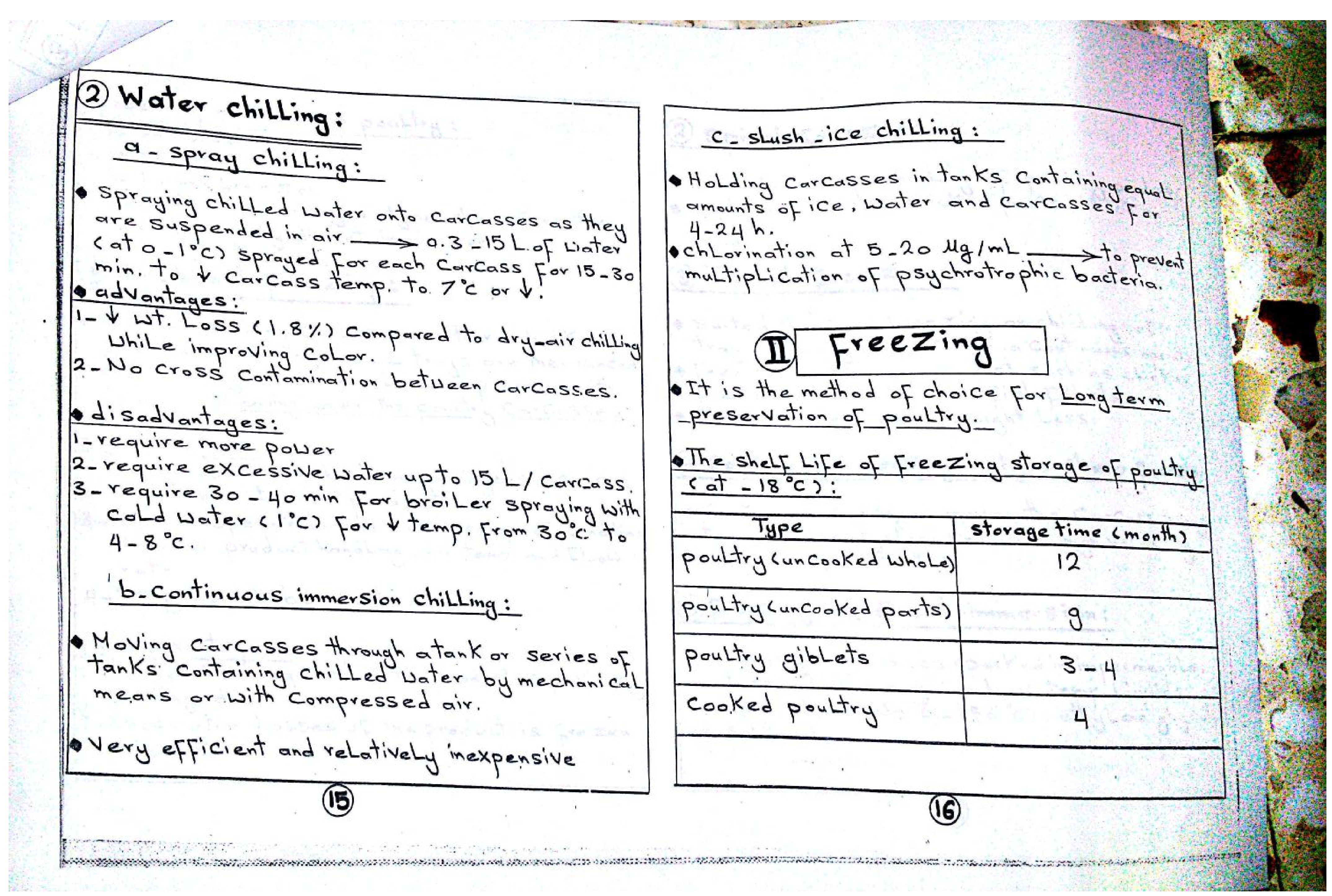
preservation of poultry

I chilling (Refrigeration)

- used for short term storage of poultry → because it slows down the microbial growth and enzymatic as well as chemical reactions.
- poultry carcasses can be chilled by: (chilling methods for poultry)

① Air-blast chilling :

- passing the carcasses on conveyer through chilling room.
- pre-chilling for 1 h at 5 °c → followed by 1.5 h at 0 °c.
- carcasses have very attractive appearance with extended shelf life of 8.8 days (at 2 °c storage temp.)



② Water chilling:

a - spray chilling:

- Spraying chilled water onto carcasses as they are suspended in air ⟶ 0.3 - 15 L of water (at 0 - 1°C) sprayed for each carcass for 15 - 30 min. to ↓ carcass temp. to 7°C or ↓.
- advantages:

1- ↓ wt. Loss (1.8%) compared to dry-air chilling while improving color.
2- No cross contamination between carcasses.

- disadvantages:

1- require more power
2- require excessive water up to 15 L / carcass.
3- require 30 - 40 min for broiler spraying with cold water (1°C) for ↓ temp. from 30°C to 4 - 8°C.

b- Continuous immersion chilling:

- Moving carcasses through a tank or series of tanks containing chilled water by mechanical means or with compressed air.
- Very efficient and relatively inexpensive

c- slush - ice chilling:

- Holding carcasses in tanks containing equal amounts of ice, water and carcasses for 4-24 h.
- chlorination at 5-20 µg/mL ⟶ to prevent multiplication of psychrotrophic bacteria.

II Freezing

- It is the method of choice for Long term preservation of poultry.
- The shelf life of freezing storage of poultry (at -18°C):

Type	storage time (month)
poultry (uncooked whole)	12
poultry (uncooked parts)	9
poultry giblets	3 - 4
Cooked poultry	4

• Freezing methods for poultry:

- → air-blast freezing
- → spiral freezer
- → Tunnel freezer
- → Continuous conveyor-type sharp freezier
- → freezing by direct immersion

① Air-blast freezing:

• placing poultry carcasses (either in bulk or in packages) on trays ⟶ trays are then placed on freezing racks in a low temp. room with cold air blowing over the poultry carcasses.

• advantages:

1- Can be applied to bulk or package carcasses
2- adaptable to most products.
3- Can be operated under a wide range of conditions such as product handling, air temp. and flow rate.
4- very low labor costs.

• disadvantages:

1- Longer time required if the product is previously packaged.
2- Evaporation losses if the product is frozen in bulk.

② Spiral freezer:

• used for deep-chilling of poultry products.
• applied to freeze chicken parts, chicken nuggets.

③ Tunnel freezer:

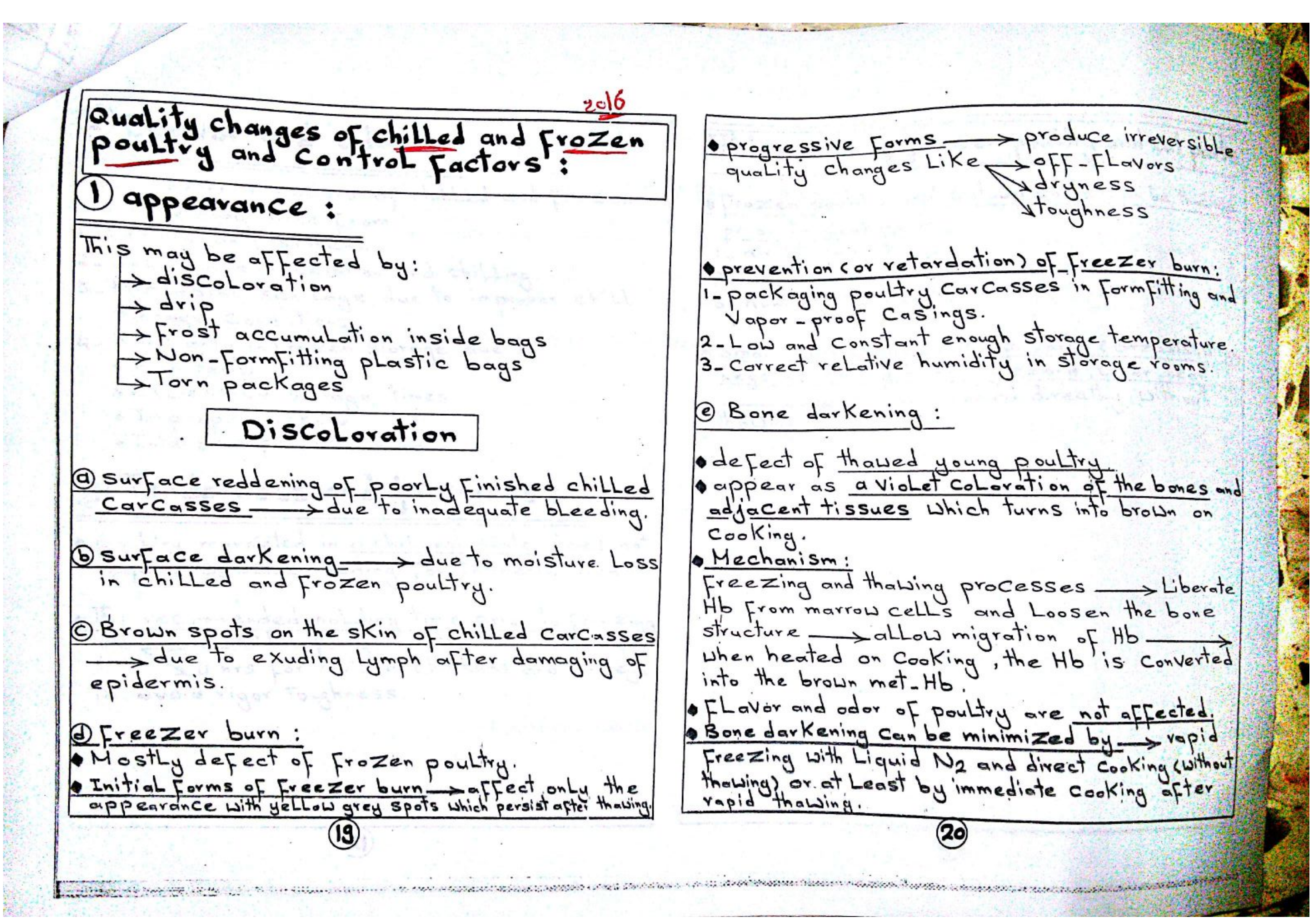
• Suited for crust freezing or chilling of tray-packaged parts on a continuous operation.
• freeze or chill any product such as chicken pieces, meatballs or fish fillets.
• It minimize product weight loss.

④ Continuous conveyor-type sharp freezer:

a continuous conveyor moving the carcass through a tunnel-like system fed with high velocity air blasts (-37.2°C)

⑤ Freezing by direct immersion:

Immersing carcasses (packed in impermeable, heat-shrinkable bags) in low temp. liquids such as liquid N_2 (-196°C), ethylene glycol or salt soln.



2016

Quality changes of chilled and frozen poultry and control factors :

1) appearance :

This may be affected by:
- → discoloration
- → drip
- → frost accumulation inside bags
- → Non-formfitting plastic bags
- → Torn packages

Discoloration

ⓐ Surface reddening of poorly finished chilled carcasses → due to inadequate bleeding.

ⓑ Surface darkening → due to moisture loss in chilled and frozen poultry.

ⓒ Brown spots on the skin of chilled carcasses → due to exuding lymph after damaging of epidermis.

ⓓ Freezer burn :
- Mostly defect of frozen poultry.
- Initial forms of freezer burn → affect only the appearance with yellow grey spots which persist after thawing.

- progressive forms → produce irreversible quality changes like → off-flavors, → dryness, → toughness
- prevention (or retardation) of freezer burn:
  1. packaging poultry carcasses in formfitting and vapor-proof casings.
  2. Low and constant enough storage temperature.
  3. Correct relative humidity in storage rooms.

ⓔ Bone darkening :
- defect of thawed young poultry.
- appear as a violet coloration of the bones and adjacent tissues which turns into brown on cooking.
- Mechanism:

Freezing and thawing processes → Liberate Hb from marrow cells and loosen the bone structure → allow migration of Hb → when heated on cooking, the Hb is converted into the brown met-Hb.

- Flavor and odor of poultry are not affected.
- Bone darkening can be minimized by → rapid freezing with liquid N_2 and direct cooking (without thawing) or at least by immediate cooking after rapid thawing.

② Flavor and odor :

off-flavors and odors of chilled and frozen poultry may arise from :

1- Feeding on fish meal
2- delayed evisceration and chilling.
3- Microbial spoilage due to improper chill storage conditions.
4- Rancidity in frozen storage due to :
   - high temp.
   - excessive storage times
   - Improper package
   - Intensive freezer burn.

③ Tenderness and juiciness :

- poultry marketed in a chilled state does not require special holding for tenderization.

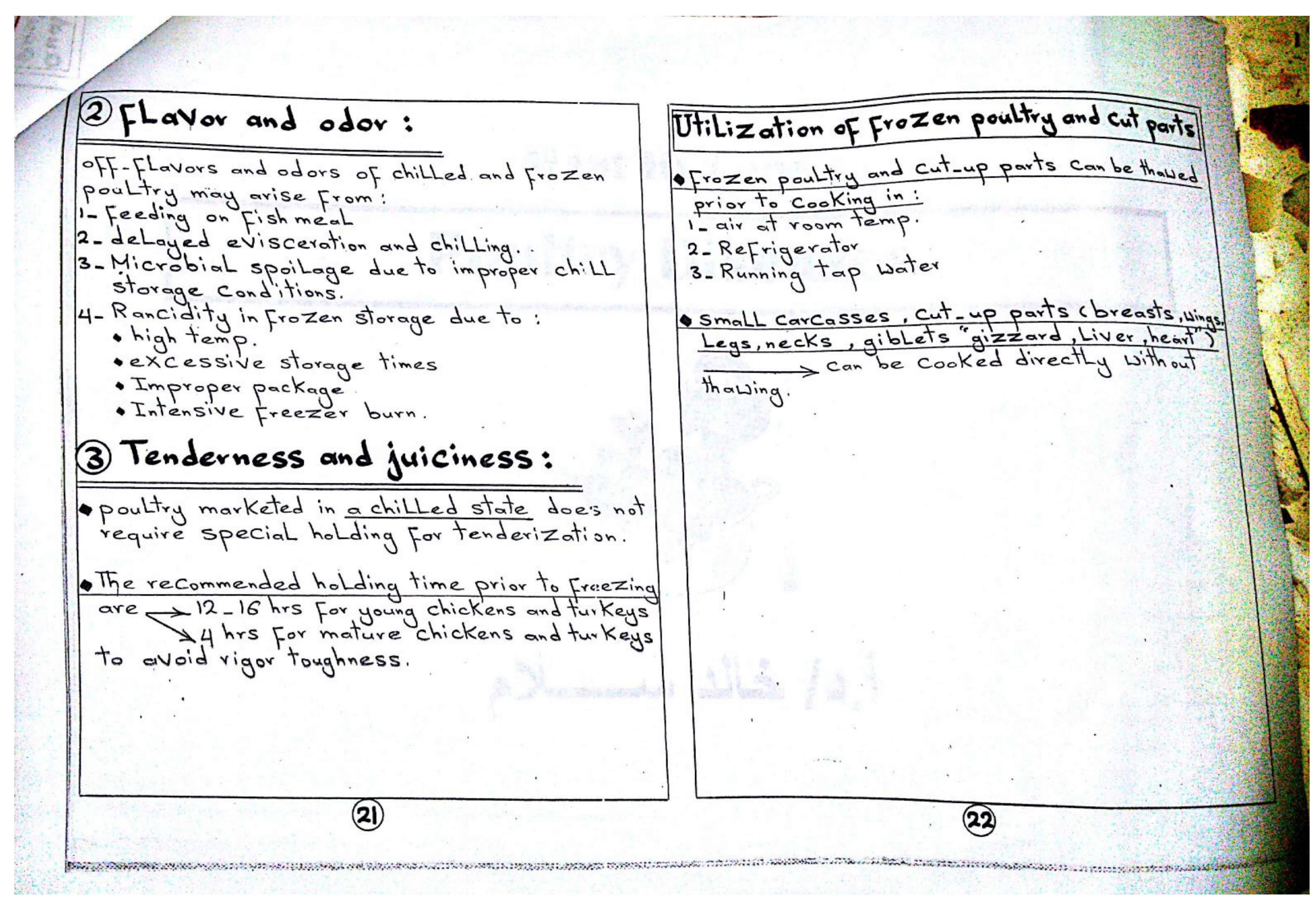
- The recommended holding time prior to freezing are → 12_16 hrs for young chickens and turkeys
  → 4 hrs for mature chickens and turkeys

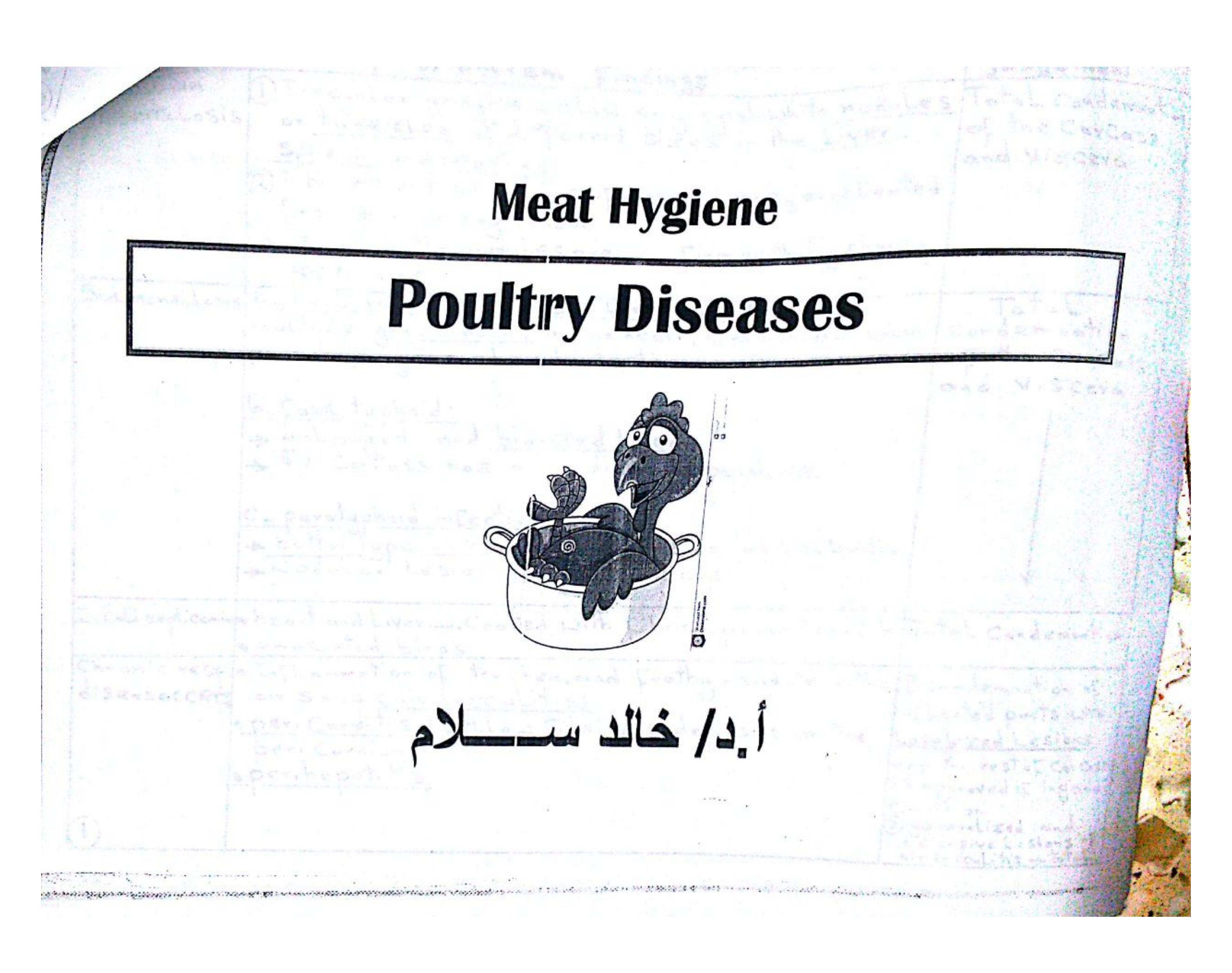
to avoid rigor toughness.

Utilization of frozen poultry and cut parts

- frozen poultry and cut_up parts can be thawed prior to cooking in :
  1- air at room temp.
  2- Refrigerator
  3- Running tap water

- Small carcasses, cut_up parts (breasts, wings, Legs, necks, giblets "gizzard, Liver, heart") → can be cooked directly without thawing.




Meat Hygiene
Poultry Diseases
أ.د/ خالد ســلام

Disease	Postmortem Findings	judgement
Avian Tuberculosis	① Irregular greyish yellow or greyish white nodules or tubercles of different sizes in the Liver, Spleen and intestine. ② T.B Lesions on organ Surfaces → easy enucleated from surrounding tissue → When cut, the nodules are → Firm with dry cheesy appearance.	Total Condemnation of the Carcass and Viscera
Salmonellosis	a- pullorum disease (Bacillary white diarrhea): multiple grey nodules in the heart, Lungs, Liver, Spleen, peritoneum, gizzard and intestine b- Fowl typhoid: → enlarged and bronzed Liver → The Carcass has a jaundiced appearance c- paratyphoid infection: → button type Lesion in the intestine and enteritis → Nodular Lesions in the pancreas	Total Condemnation of the Carcass and Viscera ↓
E. coli septicemia	• heart and Liver → Coated with fibrino-purulent exudate • emaciated birds	Total Condemnation
Chronic resp. disease (CRD)	• Inflammation of trachea, and frothy exudate in the air sacs (air sacculitis) • pericarditis (yellow fibrinous deposits on the pericardium) • perihepatitis	① Condemnation of affected parts with Localized Lesions and the rest of Carcass is approved if in good Condition. ② generalized and extensive Lesions of air sacculitis → total

Scanned by CamScanner

Disease	Postmortem Findings	Judgement
Fowl cholera (pasteurellosis)	• Caseous exudate in wattles, sinuses, middle ear, joints or tendon sheaths. • pet. and ecchymotic hemorrhage on heart, serous and mucous mm. and abd. fat. • Corn meal liver.	• Septicemic carcass → condemned. • Localized lesions → condemnation of affected parts
avian influenza (fowl plague)	• peracute form → death with no significant gross lesions • highly pathogenic virus: fibrinous exudate in air sacs, oviduct, peritoneum and pericardium • Mild to moderate infection: 1- pronounced congestion of musculature 2- edema of head with congestion, hemorrhage and cyanosis of comb, wattles and sinuses 3- pet. and ecchymotic hemorrhage in abd. fat, serosal and mucosal surfaces	Total condemnation
Newcastle disease	1- acute form: → death with no lesions → hemorrhage in proventriculus (esp. at junction bet. esophagus and proventriculus). → Tracheal mucosa → hemorrhagic 2- chronic form: catarrhal inflammation of the resp. system.	1- Total condemnation 2- disinfection of premises and equipments. 3- Infected birds should not be admitted to the abattoir.

disease	postmortem Findings	judgement
abscess	• abscess not have thick Capsule • pus → dry and odorLess	LocaL trimming
Breast bListers	• FaLse bursa Contain Serous FLuid over the KeeL or breast bone → may beCome infected → Large abscess • Can extend into the breast Mm and even into the bony sternum.	• Trimming of affected parts • IF Mm and bone are affected → TotaL Condemnation.
Bruising	• The most Common pLace → Legs and hip joints. • The CoLor → bLue, green or red in CoLor.	depend upon the extent and Severity of Lesions
broKen bone	antemortem Fracture → hemorrhage whiLe postmortem Fracture → No hemorrhage	• broKen bones associated with hemorrhage → remove aLL the affected tissues. • broKen bone without hemorrhage/ with ruptured sKin → remove affected bone and associated Mm. • broKen bone without hemorrhage/ with no ruptured sKin → depend on Seriousness of Fracture → IF there are SeveraL pieces of broKen bone → Trimming → straight breaK of one bone → Left as Fit For human Consumption
Emaciation	• MuscLes are wasted and FLabby • absence of Fat	TotaL Condemnation

3